1. What are the *possible Rational* roots of the polynomial below?

$$f(x) = 6x^4 + 2x^3 + 4x^2 + 5x + 4$$

A. $\pm 1, \pm 2, \pm 4$

B. All combinations of: $\dfrac{\pm 1, \pm 2, \pm 4}{\pm 1, \pm 2, \pm 3, \pm 6}$

C. $\pm 1, \pm 2, \pm 3, \pm 6$

D. All combinations of: $\dfrac{\pm 1, \pm 2, \pm 3, \pm 6}{\pm 1, \pm 2, \pm 4}$

E. There is no formula or theorem that tells us all possible Rational roots.

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2. Perform the division below. Then, find the intervals that correspond to the quotient in the form $ax^2 + bx + c$ and remainder r.

$$\frac{12x^3 - 36x - 28}{x - 2}$$

A. $a \in [11, 16], b \in [10, 17], c \in [-27, -21]$, and $r \in [-55, -47]$.

B. $a \in [24, 25], b \in [-49, -46], c \in [60, 64]$, and $r \in [-150, -142]$.

C. $a \in [11, 16], b \in [-26, -23], c \in [11, 17]$, and $r \in [-55, -47]$.

D. $a \in [24, 25], b \in [47, 50], c \in [60, 64]$, and $r \in [91, 96]$.

E. $a \in [11, 16], b \in [24, 26], c \in [11, 17]$, and $r \in [-5, -1]$.

---

3. Factor the polynomial below completely, knowing that $x - 4$ is a factor. Then, choose the intervals the zeros of the polynomial belong to, where $z_1 \leq z_2 \leq z_3 \leq z_4$. *To make the problem easier, all zeros are between -5 and 5.*

$$f(x) = 12x^4 - 61x^3 + 15x^2 + 178x - 120$$

A. $z_1 \in [-0.96, -0.32]$, $z_2 \in [1.3, 2.27], z_3 \in [1.63, 2.06]$, and $z_4 \in [3.61, 4.69]$

B. $z_1 \in [-5.22, -3.24]$, $z_2 \in [-2.02, -0.96], z_3 \in [-0.28, -0.21]$, and $z_4 \in [4.73, 5.53]$

C. $z_1 \in [-2.16, -1.43]$, $z_2 \in [0.41, 0.76]$, $z_3 \in [1.63, 2.06]$, and $z_4 \in [3.61, 4.69]$

D. $z_1 \in [-5.22, -3.24]$, $z_2 \in [-2.02, -0.96]$, $z_3 \in [-0.87, -0.32]$, and $z_4 \in [1.55, 1.79]$

E. $z_1 \in [-5.22, -3.24]$, $z_2 \in [-2.02, -0.96]$, $z_3 \in [-1.42, -1.27]$, and $z_4 \in [-0.02, 0.92]$

---

4. Factor the polynomial below completely. Then, choose the intervals the zeros of the polynomial belong to, where $z_1 \leq z_2 \leq z_3$. *To make the problem easier, all zeros are between -5 and 5.*

$$f(x) = 10x^3 - 49x^2 + 42x + 45$$

A. $z_1 \in [-1.8, -1.5]$, $z_2 \in [0.33, 0.84]$, and $z_3 \in [2.97, 3.01]$

B. $z_1 \in [-5.1, -4.2]$, $z_2 \in [-3.32, -2.82]$, and $z_3 \in [0.28, 0.38]$

C. $z_1 \in [-3.1, -2.9]$, $z_2 \in [-1.21, -0.2]$, and $z_3 \in [1.64, 1.76]$

D. $z_1 \in [-0.7, 0.4]$, $z_2 \in [2.4, 2.99]$, and $z_3 \in [2.97, 3.01]$

E. $z_1 \in [-3.1, -2.9]$, $z_2 \in [-2.57, -2.28]$, and $z_3 \in [0.47, 0.78]$

---

5. Factor the polynomial below completely. Then, choose the intervals the zeros of the polynomial belong to, where $z_1 \leq z_2 \leq z_3$. *To make the problem easier, all zeros are between -5 and 5.*

$$f(x) = 15x^3 + 94x^2 + 101x + 30$$

A. $z_1 \in [-5.29, -4.77]$, $z_2 \in [-2, -1.62]$, and $z_3 \in [-1.7, -1.3]$

B. $z_1 \in [-0.77, 0.55]$, $z_2 \in [1.75, 2.15]$, and $z_3 \in [4.3, 5.2]$

C. $z_1 \in [0.52, 0.97]$, $z_2 \in [0.63, 0.76]$, and $z_3 \in [4.3, 5.2]$

D. $z_1 \in [1.45, 1.92]$, $z_2 \in [1.29, 1.9]$, and $z_3 \in [4.3, 5.2]$

E. $z_1 \in [-5.29, -4.77]$, $z_2 \in [-0.83, -0.09]$, and $z_3 \in [-1.1, 1.1]$

---

6. Perform the division below. Then, find the intervals that correspond to the quotient in the form $ax^2 + bx + c$ and remainder r.

$$\frac{6x^3 - 18x^2 - 36x + 43}{x - 4}$$

A. $a \in [5, 7],\ b \in [5, 11],\ c \in [-12, -10],$ and $r \in [-10, -3]$.

B. $a \in [24, 28],\ b \in [-117, -109],\ c \in [414, 423],$ and $r \in [-1638, -1632]$.

C. $a \in [24, 28],\ b \in [73, 79],\ c \in [272, 279],$ and $r \in [1145, 1153]$.

D. $a \in [5, 7],\ b \in [-45, -36],\ c \in [132, 137],$ and $r \in [-490, -482]$.

E. $a \in [5, 7],\ b \in [-4, 4],\ c \in [-38, -31],$ and $r \in [-68, -63]$.

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7. Perform the division below. Then, find the intervals that correspond to the quotient in the form $ax^2 + bx + c$ and remainder r.

$$\frac{20x^3 - 65x^2 - 160x - 72}{x - 5}$$

A. $a \in [15, 23],\ b \in [32, 39],\ c \in [13, 23],$ and $r \in [2, 4]$.

B. $a \in [96, 103],\ b \in [427, 441],\ c \in [2012, 2022],$ and $r \in [9997, 10006]$.

C. $a \in [15, 23],\ b \in [14, 17],\ c \in [-104, -98],$ and $r \in [-479, -467]$.

D. $a \in [15, 23],\ b \in [-172, -161],\ c \in [663, 670],$ and $r \in [-3400, -3394]$.

E. $a \in [96, 103],\ b \in [-565, -560],\ c \in [2665, 2671],$ and $r \in [-13401, -13395]$.

---

8. Perform the division below. Then, find the intervals that correspond to the quotient in the form $ax^2 + bx + c$ and remainder r.

$$\frac{12x^3 + 52x^2 - 62}{x + 4}$$

A. $a \in [10, 14], b \in [3, 9], c \in [-21, -13],$ and $r \in [1, 8]$.

B. $a \in [-55, -46], b \in [-141, -136], c \in [-569, -557],$ and $r \in [-2302, -2299]$.

C. $a \in [-55, -46], b \in [244, 248], c \in [-976, -972],$ and $r \in [3838, 3846]$.

D. $a \in [10, 14], b \in [94, 102], c \in [394, 403],$ and $r \in [1537, 1539]$.

E. $a \in [10, 14], b \in [-13, -5], c \in [36, 41],$ and $r \in [-267, -260]$.

---

9. Factor the polynomial below completely, knowing that $x+4$ is a factor. Then, choose the intervals the zeros of the polynomial belong to, where $z_1 \leq z_2 \leq z_3 \leq z_4$. *To make the problem easier, all zeros are between -5 and 5.*

$$f(x) = 12x^4 - 23x^3 - 244x^2 + 235x + 300$$

A. $z_1 \in [-4.25, -3.89],\ z_2 \in [-0.85, -0.62], z_3 \in [1.41, 1.73],$ and $z_4 \in [4.1, 5.5]$

B. $z_1 \in [-6.08, -4.94],\ z_2 \in [-0.65, -0.56], z_3 \in [1.32, 1.36],$ and $z_4 \in [3.9, 4.7]$

C. $z_1 \in [-6.08, -4.94],\ z_2 \in [-0.49, -0.34], z_3 \in [2.96, 3.22],$ and $z_4 \in [3.9, 4.7]$

D. $z_1 \in [-4.25, -3.89],\ z_2 \in [-1.37, -1.11], z_3 \in [0.45, 0.66],$ and $z_4 \in [4.1, 5.5]$

E. $z_1 \in [-6.08, -4.94],\ z_2 \in [-1.84, -1.45], z_3 \in [0.7, 0.83],$ and $z_4 \in [3.9, 4.7]$

---

10. What are the *possible Integer* roots of the polynomial below?

$$f(x) = 4x^4 + 2x^3 + 4x^2 + 6x + 6$$

A. $\pm 1, \pm 2, \pm 3, \pm 6$

B. $\pm 1, \pm 2, \pm 4$

C. All combinations of: $\dfrac{\pm 1, \pm 2, \pm 3, \pm 6}{\pm 1, \pm 2, \pm 4}$

D. All combinations of: $\dfrac{\pm 1, \pm 2, \pm 4}{\pm 1, \pm 2, \pm 3, \pm 6}$

E. There is no formula or theorem that tells us all possible Integer roots.

---

11. What are the *possible Integer* roots of the polynomial below?

$$f(x) = 6x^3 + 4x^2 + 3x + 3$$

A. All combinations of: $\dfrac{\pm 1, \pm 2, \pm 3, \pm 6}{\pm 1, \pm 3}$

B. $\pm 1, \pm 2, \pm 3, \pm 6$

C. $\pm 1, \pm 3$

D. All combinations of: $\dfrac{\pm 1, \pm 3}{\pm 1, \pm 2, \pm 3, \pm 6}$

E. There is no formula or theorem that tells us all possible Integer roots.

---

12. Perform the division below. Then, find the intervals that correspond to the quotient in the form $ax^2 + bx + c$ and remainder r.

$$\frac{15x^3 - 38x^2 + 34}{x - 2}$$

A. $a \in [27, 31], b \in [21, 25], c \in [41, 48]$, and $r \in [122, 126]$.

B. $a \in [27, 31], b \in [-100, -94], c \in [196, 202]$, and $r \in [-362, -355]$.

C. $a \in [13, 19], b \in [-8, -7], c \in [-18, -15]$, and $r \in [0, 8]$.

D. $a \in [13, 19], b \in [-72, -66], c \in [135, 142]$, and $r \in [-244, -232]$.

E. $a \in [13, 19], b \in [-23, -20], c \in [-27, -20]$, and $r \in [10, 15]$.

---

13. Factor the polynomial below completely, knowing that $x - 5$ is a factor. Then, choose the intervals the zeros of the polynomial belong to, where $z_1 \leq z_2 \leq z_3 \leq z_4$. *To make the problem easier, all zeros are between -5 and 5.*

$$f(x) = 12x^4 - 1x^3 - 266x^2 - 205x + 300$$

A. $z_1 \in [-4.9, -3.1]$, $z_2 \in [-1.79, -1.55], z_3 \in [0.73, 0.83]$, and $z_4 \in [4.82, 5.32]$

B. $z_1 \in [-5.2, -4.6]$, $z_2 \in [-1.39, -1.31], z_3 \in [0.52, 0.73]$, and $z_4 \in [3.73, 4.71]$

C. $z_1 \in [-5.2, -4.6]$, $z_2 \in [-0.91, -0.61]$, $z_3 \in [1.58, 1.83]$, and $z_4 \in [3.73, 4.71]$

D. $z_1 \in [-4.9, -3.1]$, $z_2 \in [-0.71, -0.54]$, $z_3 \in [1.24, 1.38]$, and $z_4 \in [4.82, 5.32]$

E. $z_1 \in [-5.2, -4.6]$, $z_2 \in [-3.17, -2.81]$, $z_3 \in [0.4, 0.57]$, and $z_4 \in [3.73, 4.71]$

---

14. Factor the polynomial below completely. Then, choose the intervals the zeros of the polynomial belong to, where $z_1 \leq z_2 \leq z_3$. *To make the problem easier, all zeros are between -5 and 5.*

$$f(x) = 25x^3 - 50x^2 - 69x - 18$$

A. $z_1 \in [-3.9, -2.8]$, $z_2 \in [-0.07, 0.38]$, and $z_3 \in [2.7, 4.2]$

B. $z_1 \in [-2.6, -1.3]$, $z_2 \in [-1.75, -1.59]$, and $z_3 \in [2.7, 4.2]$

C. $z_1 \in [-3.9, -2.8]$, $z_2 \in [0.23, 0.59]$, and $z_3 \in [-0.3, 1.1]$

D. $z_1 \in [-3.9, -2.8]$, $z_2 \in [1.62, 1.74]$, and $z_3 \in [2.3, 2.9]$

E. $z_1 \in [-1.6, 0.1]$, $z_2 \in [-0.46, -0.26]$, and $z_3 \in [2.7, 4.2]$

---

15. Factor the polynomial below completely. Then, choose the intervals the zeros of the polynomial belong to, where $z_1 \leq z_2 \leq z_3$. *To make the problem easier, all zeros are between -5 and 5.*

$$f(x) = 12x^3 - 77x^2 + 131x - 60$$

A. $z_1 \in [0.63, 0.78]$, $z_2 \in [1.57, 1.81]$, and $z_3 \in [4, 4.07]$

B. $z_1 \in [0.6, 0.71]$, $z_2 \in [1.23, 1.4]$, and $z_3 \in [4, 4.07]$

C. $z_1 \in [-4.1, -3.95]$, $z_2 \in [-1.92, -1.56]$, and $z_3 \in [-0.81, -0.65]$

D. $z_1 \in [-5.12, -4.95]$, $z_2 \in [-4.14, -3.6]$, and $z_3 \in [-0.28, -0.19]$

E. $z_1 \in [-4.1, -3.95]$, $z_2 \in [-1.56, -1.04]$, and $z_3 \in [-0.74, -0.46]$

---

16. Perform the division below. Then, find the intervals that correspond to the quotient in the form $ax^2 + bx + c$ and remainder r.

$$\frac{16x^3 - 24x^2 - 31x + 35}{x - 2}$$

A. $a \in [30, 39], \; b \in [-89, -86], \; c \in [145, 149], \text{ and } r \in [-257, -250].$

B. $a \in [13, 17], \; b \in [1, 9], \; c \in [-15, -11], \text{ and } r \in [2, 13].$

C. $a \in [13, 17], \; b \in [-59, -55], \; c \in [74, 85], \text{ and } r \in [-127, -124].$

D. $a \in [30, 39], \; b \in [39, 43], \; c \in [46, 50], \text{ and } r \in [127, 135].$

E. $a \in [13, 17], \; b \in [-11, -7], \; c \in [-43, -34], \text{ and } r \in [-4, 2].$

---

17. Perform the division below. Then, find the intervals that correspond to the quotient in the form $ax^2 + bx + c$ and remainder r.

$$\frac{10x^3 - 40x^2 - 10x + 37}{x - 4}$$

A. $a \in [7, 13], \; b \in [-2, 7], \; c \in [-10, -6], \text{ and } r \in [-5, 0].$

B. $a \in [7, 13], \; b \in [-11, -3], \; c \in [-42, -38], \text{ and } r \in [-88, -79].$

C. $a \in [35, 44], \; b \in [-201, -193], \; c \in [788, 794], \text{ and } r \in [-3124, -3119].$

D. $a \in [7, 13], \; b \in [-83, -73], \; c \in [306, 313], \text{ and } r \in [-1203, -1196].$

E. $a \in [35, 44], \; b \in [119, 129], \; c \in [464, 476], \text{ and } r \in [1916, 1918].$

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18. Perform the division below. Then, find the intervals that correspond to the quotient in the form $ax^2 + bx + c$ and remainder r.

$$\frac{8x^3 - 62x + 35}{x + 3}$$

A. $a \in [-29, -20], b \in [-76, -71], c \in [-280, -275], \text{ and } r \in [-800, -798].$

B. $a \in [-29, -20], b \in [69, 75], c \in [-280, -275], \text{ and } r \in [869, 873].$

C. $a \in [8, 14], b \in [-35, -31], c \in [66, 67], \text{ and } r \in [-233, -227].$

D. $a \in [8, 14], b \in [22, 30], c \in [9, 22]$, and $r \in [60, 72]$.

E. $a \in [8, 14], b \in [-26, -21], c \in [9, 22]$, and $r \in [4, 8]$.

---

19. Factor the polynomial below completely, knowing that $x-5$ is a factor. Then, choose the intervals the zeros of the polynomial belong to, where $z_1 \leq z_2 \leq z_3 \leq z_4$. *To make the problem easier, all zeros are between -5 and 5.*

$$f(x) = 15x^4 - 44x^3 - 159x^2 + 8x + 60$$

A. $z_1 \in [-10, -4]$, $z_2 \in [-0.26, -0.18], z_3 \in [1.99, 2.03]$, and $z_4 \in [1, 4]$

B. $z_1 \in [-10, -4]$, $z_2 \in [-0.66, -0.58], z_3 \in [0.65, 0.68]$, and $z_4 \in [1, 4]$

C. $z_1 \in [-10, -4]$, $z_2 \in [-1.68, -1.51], z_3 \in [1.46, 1.52]$, and $z_4 \in [1, 4]$

D. $z_1 \in [-2, 1]$, $z_2 \in [-0.73, -0.64], z_3 \in [0.58, 0.61]$, and $z_4 \in [5, 6]$

E. $z_1 \in [-2, 1]$, $z_2 \in [-1.52, -1.49], z_3 \in [1.63, 1.71]$, and $z_4 \in [5, 6]$

---

20. What are the *possible Rational* roots of the polynomial below?

$$f(x) = 3x^2 + 6x + 7$$

A. $\pm 1, \pm 3$

B. All combinations of: $\dfrac{\pm 1, \pm 3}{\pm 1, \pm 7}$

C. $\pm 1, \pm 7$

D. All combinations of: $\dfrac{\pm 1, \pm 7}{\pm 1, \pm 3}$

E. There is no formula or theorem that tells us all possible Rational roots.

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21. What are the *possible Rational* roots of the polynomial below?

$$f(x) = 4x^4 + 6x^3 + 5x^2 + 4x + 3$$

A. All combinations of: $\dfrac{\pm 1, \pm 3}{\pm 1, \pm 2, \pm 4}$

B. $\pm 1, \pm 3$

C. All combinations of: $\dfrac{\pm 1, \pm 2, \pm 4}{\pm 1, \pm 3}$

D. $\pm 1, \pm 2, \pm 4$

E. There is no formula or theorem that tells us all possible Rational roots.

---

22. Perform the division below. Then, find the intervals that correspond to the quotient in the form $ax^2 + bx + c$ and remainder r.

$$\frac{20x^3 - 60x + 44}{x + 2}$$

A. $a \in [19, 22], b \in [-62, -58], c \in [115, 129],$ and $r \in [-316, -315]$.

B. $a \in [19, 22], b \in [-41, -38], c \in [16, 27],$ and $r \in [2, 5]$.

C. $a \in [-41, -34], b \in [-82, -79], c \in [-222, -212],$ and $r \in [-396, -391]$.

D. $a \in [-41, -34], b \in [74, 87], c \in [-222, -212],$ and $r \in [478, 485]$.

E. $a \in [19, 22], b \in [37, 41], c \in [16, 27],$ and $r \in [81, 89]$.

---

23. Factor the polynomial below completely, knowing that $x + 5$ is a factor. Then, choose the intervals the zeros of the polynomial belong to, where $z_1 \leq z_2 \leq z_3 \leq z_4$. *To make the problem easier, all zeros are between -5 and 5.*

$$f(x) = 15x^4 + 151x^3 + 429x^2 + 185x - 300$$

A. $z_1 \in [-0.52, 0.32],\ z_2 \in [3.14, 4.93], z_3 \in [4.85, 5.74],$ and $z_4 \in [4.91, 6.54]$

B. $z_1 \in [-5.08, -4.82],\ z_2 \in [-4.33, -2.95], z_3 \in [-1.8, -1.17],$ and $z_4 \in [0.44, 1.16]$

C. $z_1 \in [-1.83, -1.54],\ z_2 \in [0.34, 0.99], z_3 \in [3.09, 4.44],$ and $z_4 \in [4.91, 6.54]$

D. $z_1 \in [-5.08, -4.82]$, $z_2 \in [-4.33, -2.95]$, $z_3 \in [-0.77, -0.17]$, and $z_4 \in [0.89, 2.04]$

E. $z_1 \in [-1.07, -0.25]$, $z_2 \in [1.41, 2.22]$, $z_3 \in [3.09, 4.44]$, and $z_4 \in [4.91, 6.54]$

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24. Factor the polynomial below completely. Then, choose the intervals the zeros of the polynomial belong to, where $z_1 \leq z_2 \leq z_3$. *To make the problem easier, all zeros are between -5 and 5.*

$$f(x) = 12x^3 + 11x^2 - 45x - 50$$

A. $z_1 \in [-0.89, -0.61]$, $z_2 \in [-0.68, -0.46]$, and $z_3 \in [1.96, 2.53]$

B. $z_1 \in [-1.84, -1.27]$, $z_2 \in [-1.31, -1.2]$, and $z_3 \in [1.96, 2.53]$

C. $z_1 \in [-2.26, -1.88]$, $z_2 \in [0.35, 0.54]$, and $z_3 \in [4.65, 5.07]$

D. $z_1 \in [-2.26, -1.88]$, $z_2 \in [0.45, 0.67]$, and $z_3 \in [0.65, 0.85]$

E. $z_1 \in [-2.26, -1.88]$, $z_2 \in [1.12, 1.42]$, and $z_3 \in [1.03, 1.93]$

---

25. Factor the polynomial below completely. Then, choose the intervals the zeros of the polynomial belong to, where $z_1 \leq z_2 \leq z_3$. *To make the problem easier, all zeros are between -5 and 5.*

$$f(x) = 10x^3 + x^2 - 77x + 30$$

A. $z_1 \in [-2.06, -1.86]$, $z_2 \in [-0.7, -0.5]$, and $z_3 \in [2.63, 3.17]$

B. $z_1 \in [-3.19, -2.73]$, $z_2 \in [0.32, 0.41]$, and $z_3 \in [2.14, 2.85]$

C. $z_1 \in [-3.19, -2.73]$, $z_2 \in [0.32, 0.41]$, and $z_3 \in [2.14, 2.85]$

D. $z_1 \in [-2.57, -2.12]$, $z_2 \in [-0.48, -0.3]$, and $z_3 \in [2.63, 3.17]$

E. $z_1 \in [-2.57, -2.12]$, $z_2 \in [-0.48, -0.3]$, and $z_3 \in [2.63, 3.17]$

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26. Perform the division below. Then, find the intervals that correspond to the quotient in the form $ax^2 + bx + c$ and remainder r.

$$\frac{15x^3 + 65x^2 + 90x + 37}{x + 2}$$

A. $a \in [15, 20], \; b \in [19, 21], \; c \in [30, 31], \text{ and } r \in [-56, -46].$

B. $a \in [15, 20], \; b \in [35, 38], \; c \in [16, 22], \text{ and } r \in [-4, -2].$

C. $a \in [15, 20], \; b \in [90, 97], \; c \in [280, 281], \text{ and } r \in [588, 607].$

D. $a \in [-32, -28], \; b \in [124, 127], \; c \in [-163, -157], \text{ and } r \in [356, 359].$

E. $a \in [-32, -28], \; b \in [4, 6], \; c \in [96, 103], \text{ and } r \in [227, 239].$

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27. Perform the division below. Then, find the intervals that correspond to the quotient in the form $ax^2 + bx + c$ and remainder r.

$$\frac{6x^3 + 27x^2 + 39x + 23}{x + 2}$$

A. $a \in [-14, -8], \; b \in [46, 55], \; c \in [-64, -57], \text{ and } r \in [149, 153].$

B. $a \in [1, 10], \; b \in [39, 40], \; c \in [116, 119], \text{ and } r \in [253, 263].$

C. $a \in [-14, -8], \; b \in [3, 5], \; c \in [41, 48], \text{ and } r \in [111, 118].$

D. $a \in [1, 10], \; b \in [9, 13], \; c \in [12, 14], \text{ and } r \in [-14, -7].$

E. $a \in [1, 10], \; b \in [15, 24], \; c \in [3, 10], \text{ and } r \in [2, 12].$

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28. Perform the division below. Then, find the intervals that correspond to the quotient in the form $ax^2 + bx + c$ and remainder r.

$$\frac{12x^3 - 65x^2 + 120}{x - 5}$$

A. $a \in [11, 16], b \in [-8, -1], c \in [-27, -21], \text{ and } r \in [-7, -1].$

B. $a \in [11, 16], b \in [-125, -124], c \in [617, 628], \text{ and } r \in [-3013, -3003].$

C. $a \in [60, 65], b \in [-369, -364], c \in [1819, 1828], \text{ and } r \in [-9010, -9000].$

D. $a \in [11, 16], b \in [-19, -16], c \in [-69, -67], \text{ and } r \in [-152, -149].$

E. $a \in [60, 65], b \in [235, 241], c \in [1174, 1176], \text{ and } r \in [5995, 5996].$

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29. Factor the polynomial below completely, knowing that $x-3$ is a factor. Then, choose the intervals the zeros of the polynomial belong to, where $z_1 \leq z_2 \leq z_3 \leq z_4$. *To make the problem easier, all zeros are between -5 and 5.*

$$f(x) = 16x^4 - 112x^3 + 167x^2 + 175x - 300$$

A. $z_1 \in [-4.63, -3.96]$, $z_2 \in [-3.23, -2.25]$, $z_3 \in [-1.08, -0.54]$, and $z_4 \in [0.18, 1.04]$

B. $z_1 \in [-0.98, -0.53]$, $z_2 \in [-0.07, 0.93]$, $z_3 \in [2.84, 3.28]$, and $z_4 \in [3.16, 4.57]$

C. $z_1 \in [-4.63, -3.96]$, $z_2 \in [-3.23, -2.25]$, $z_3 \in [-0.48, 0.1]$, and $z_4 \in [4.77, 5.57]$

D. $z_1 \in [-4.63, -3.96]$, $z_2 \in [-3.23, -2.25]$, $z_3 \in [-1.68, -1.22]$, and $z_4 \in [0.94, 1.37]$

E. $z_1 \in [-1.71, -1.18]$, $z_2 \in [1.2, 2.35]$, $z_3 \in [2.84, 3.28]$, and $z_4 \in [3.16, 4.57]$

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30. What are the *possible Rational* roots of the polynomial below?

$$f(x) = 2x^3 + 7x^2 + 7x + 4$$

A. $\pm 1, \pm 2, \pm 4$

B. All combinations of: $\dfrac{\pm 1, \pm 2}{\pm 1, \pm 2, \pm 4}$

C. All combinations of: $\dfrac{\pm 1, \pm 2, \pm 4}{\pm 1, \pm 2}$

D. $\pm 1, \pm 2$

E. There is no formula or theorem that tells us all possible Rational roots.
